

## MASTER THESIS – 2026

## Fatigue and failure of mechanical elements in aviation drive lines

## Master Thesis proposal

**Background**

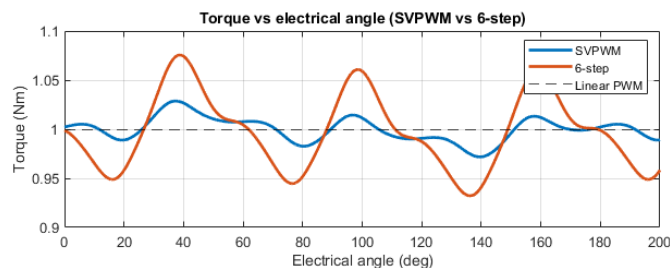
The aviation industry strives to increase available electrical power and by weight reduction operation radius and payload.

GKN Aerospace and IEA at LTH is co-operating within the Nationellt FlygForskningsProgram (nffp) to develop detailed full system models of drive electronics, control and fault tolerant electric machines to use for future decision-making input.

**The issue**

A possibly detrimental effect of increasing the electrical bus utilization by means of higher order modulation schemes is the increase of non-sinusoidal current components.

This may manifest itself as torque fluctuations of varying frequency and magnitude and it may propagate through the mechanical system causing fatigue and failure in components such as shafts, bearings, fasteners etc. where operational reliability is paramount. These fluctuations may also present themselves during certain faults.



Graph illustrating the differences in torque ripple over modulation index



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**Objectives**

- Develop a model-based or simulation framework (e.g., MATLAB/SimScape, ANSYS, or similar) to study torque ripple and vibration propagation from the electrical drive to the mechanical shaft system.
- Investigate the impact of overmodulation, 6-step operation, and open-phase or inter-turn faults on mechanical stress and fatigue in driveline components.
- Identify critical operating conditions that accelerate mechanical degradation.
- Propose design or control strategies to mitigate fatigue and improve reliability.
- Validate model in experimental test bench (optional)

**Candidate profile**

- Motivated MSc Student in M, E, F or similar
- Interest in electromechanical systems and fatigue analysis
- Experience in simulation tools such as MATLAB/ Simscape, ANSYS, COMSOL or similar

**Last day for application 2025-12-19**

**For more information or to apply** ↓



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